I CLAIM:

1. A targeted complex of the formula:
{(delivery vehicle–CM) – TMI – (CM–targeting ligand)};
wherein CM is a chelating moiety, TMI is a transition metal ion, and CM-targeting ligand is a chelating moiety (CM) covalently linked to a targeting ligand.

2. The complex of claim 1, wherein the delivery vehicle is a virus and the chelating moiety is a chelating peptide.

3. The complex of claim 2, wherein the virus lacks a native viral ligand that binds to a native cellular receptor for the virus.

4. The complex of claim 2, wherein the virus is replication competent.

5. The complex of claim 2, wherein the virus is replication deficient.

6. The complex of claim 2, wherein the virus includes a polynucleotide that encodes a p53 tumor suppressor polypeptide and the targeting ligand is a antibody that binds to a tumor antigen.

7. The complex of claim 2, wherein the virus is an adenovirus.

8. The complex of claim 7, wherein the viral coat protein is selected from a fiber, a penton and a hexon.

9. The complex of claim 7, wherein the adenovirus is replication competent.

10. The complex of claim 9, wherein the adenovirus is a wild-type adenovirus.

11. The complex of claim 9, wherein the adenovirus is a selectively replicating adenovirus.

12. The complex of claim 7, wherein the adenovirus is replication deficient.

13. The complex of claim 12, wherein the genome of the adenovirus comprises a partial or total deletion of the adenoviral E1 region.

14. The complex of claim 12, wherein the genome of the adenovirus comprises a partial or total deletion of the protein IX-encoding region.

15. The complex of claim 2, wherein the virus is selected from the group consisting of a retrovirus, a vaccinia virus, a herpes virus, an adeno-associated virus, a minute virus of mice (MVM), a human immunodeficiency virus, a sindbis virus, an MoMLV, and a hepatitis virus.

16. The complex of claim 1, wherein the delivery vehicle is selected from the group consisting of a bacteriophage, a peptide vector, a peptide-DNA aggregate, a liposome, a gas-filled microsome, and an encapsulated macromolecule.

17. The complex of claim 1, wherein the targeting ligand is an antibody.

18. The complex of claim 17, wherein the antibody is reactive with a tumor antigen.

19. The complex of claim 17, wherein the antibody is selected from the group consisting of Fab, Fab', Fab_2' and Fv fragments.

20. The complex of claim 17, wherein the antibody is a human antibody.

21. The complex of claim 17, wherein the antibody is a single chain antibody.

22. The complex of claim 21, wherein the single chain antibody is reactive with carcinoembryonic antigen.

23. The complex of claim 1, wherein the targeting ligand comprises a conformationally constrained peptide.

24. The complex of claim 23, wherein the conformationally constrained peptide comprises a portion of an adenoviral fiber protein.

25. The complex of claim 1, wherein the CM is a chelating peptide or an organic chelating agent.

26. The complex of claim 25, wherein the organic chelating agent is selected from the group consisting of a bidentate, a tridentate, a quadridentate ligand and a tripod ligand.

27. The complex of claim 26, wherein the organic chelating agent is selected from the group consisting of iminodiacetic acid, nitrilotriacetic acid, terpyridine, bipyridine, triethylenetetraamine, and biethylenetriamine.

28. The complex of claim 1, wherein the delivery vehicle is a liposome.

29. The complex of claim 1, wherein the delivery vehicle is a paramyxovirus.

30. A viral vector complex that comprises a targeting ligand that is attached to a surface polypeptide of a viral vector by a coordinate covalent linkage mediated by a transition metal ion.

31. A method of producing a kinetically inert targeted delivery vehicle complex, the method comprising:

a) preparing a kinetically labile transition metal complex by contacting a delivery vehicle–CM and a CM–targeting ligand with a transition metal ion that is in a kinetically labile oxidation state; and

b) changing the oxidation state of the metal ion to form the kinetically inert complex.

32. The method of claim **31**, wherein the kinetically labile transition metal complex is prepared by:

a) contacting the CM–targeting ligand with the transition metal ion in a reaction vessel and allowing the transition metal ion to bind to the CM to form a transition metal ion–CM–targeting ligand complex;

b) removing uncomplexed transition metal ion from the reaction vessel; and

c) contacting the transition metal ion–CM–targeting ligand complex with the delivery vehicle–CM and allowing the transition metal ion to bind to the CM to form the complex.

33. The method of claim **31**, wherein the kinetically labile transition metal complex is prepared by contacting the CM–targeting ligand and the delivery vehicle–CM with the transition metal ion simultaneously.

34. A method of delivering a therapeutic or diagnostic agent to a target cell in an organism, the method comprising administering to an organism a targeted complex of the formula:

{(delivery vehicle-CM) – TMI – (CM–targeting ligand)};

wherein delivery vehicle-CM is a delivery vehicle that displays on its surface a polypeptide that comprises a chelating moiety (CM), TMI is a transition metal ion, and CM-targeting ligand is a chelating moiety (CM) covalently linked to a targeting ligand that binds to the target cell.

35. The method of claim 34, wherein the delivery vehicle is a viral vector and the chelating moiety is a chelating peptide (CP).

36. The viral vector of claim 35, wherein the viral vector is selected from the group consisting of an adenovirus, a retrovirus, a vaccinia virus, a herpes virus, an adeno-associated virus, a minute virus of mice (MVM), a human immunodeficiency virus, a sindbis virus, an MoMLV, and a hepatitis virus.

37. The viral vector of claim 35, wherein the viral vector is an adenoviral vector and the surface polypeptide is a viral coat protein selected from the group consisting of a penton base, a hexon polypeptide, and a fiber polypeptide.

38. The method of claim 34, wherein the therapeutic agent is a gene that encodes a therapeutic polypeptide.

39. The method of claim 38, wherein the gene encodes a polypeptide selected from the group consisting of a tumor suppressor, an antigenic polypeptide, a cytotoxic polypeptide, a cytostatic polypeptide, a cytokine, a chemokine, a pharmaceutical protein, a proapoptotic polypeptide, a prodrug-activating polypeptide, an angiogenesis-inducing polypeptide, and an anti-angiogenic polypeptide.